Partial timbre modifications

Modifying partial timbres

Partial timbres, whether they are synthesized, resynthesized or sampled sounds, can be enhanced by adding effects such as vibrato, portamento, stereo, tremolo, tuning and chorus. You can add these effects to the keyboard timbre as a whole or to one of the four partial timbres.

Vibrato

Vibrato changes the pitch of a note as it is being played. The shape of the pitch change can be controlled by selecting a **vibrato wave** shape. The pitch of the note goes up and down in a shape selected using the **vibrato wave** parameter. This shape is repeated at a rate determined by the **vibrato rate** parameter.

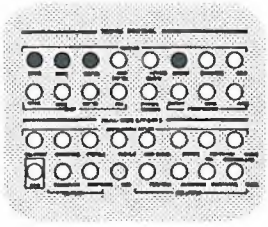
There are twelve possible vibrato wave shapes as shown on the opposite page. Each wave shape can be inverted using the **vibrato invert** button. With six of the waves, the vibrato settings of the modulator portion of timbre can be set independently using the **mod depth** button. Changes in mod depth while using these waves are apparent whenever there is an FM component in the timbre. The other six waveforms, whose names end in "2", control the carrier and modulator together. The mod depth has no effect with these six waveform selections.

Random wave shapes generate a continuous and random set of pitches changing at a rate determined by the vibrato rate setting and falling within the range determined by the vibrato depth setting. When using either of the random wave settings, you will probably never get exactly the same wave shape twice.

vibrato wave #	carrier wave	modulator wave
1	sine	independent adjust
2	triangle	independent adjust
3	ramp	independent adjust
4	inverted ramp	independent adjust
5	square	independent adjust
6	sine2	adjusted with carrier
7	triangle2	adjusted with carrier
8	ramp2	adjusted with carrier
9	inverted ramp2	adjusted with carrier
10	square2	adjusted with carrier
11	random	independent adjust
12	random2	adjusted with carrier

figure 5.1
Vibrato wave shapes

Vibrato (con't)



vibrato wave, rate depth, invert
panel 5

Setting the vibrato

1. Select the partial timbre(s) to be modified.

2. Press the **vibrato wave** button.

   The button lights, and the display window shows

   1–SINE
   [timbre name]

3. Use the control knob or press the **vibrato wave** button repeatedly to select one of the twelve vibrato wave shapes.

4. Invert the selected wave, if desired, by pressing **vibrato invert.**

5. Press the **vibrato rate** button.

   The button lights, and the display window shows

   [number] HERTZ

6. Use the control knob to select a vibrato rate between 0.00 and 50.00 hertz.

7. Press the **vibrato depth** button.

   The button lights and the display window shows

   [number] SEMITONES

8. Use the control knob to select a vibrato depth between 0.00 and 24.00 semitones.

Setting the vibrato (con't)

9. If you are programming an FM synthesis partial timbre and have selected one of waves 1 through 6 or wave 11, press the **mod depth** button.

   The button lights, and the display window shows

   [number] SEMITONES

10. Use the control knob to select a modulator vibrato depth between 0.00 and 24.00 semitones.

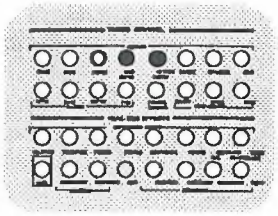
11. Press the **vibrato attack** button.

    The button lights and the display window shows

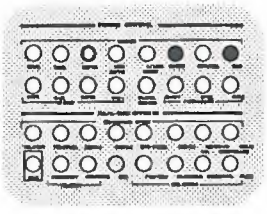
    [number] MILLISEC

12. Use the control knob to select a vibrato attack delay between zero and +10,000 milliseconds (10 seconds).

The vibrato attack parameters determine the slope of the vibrato attack. In other words, the vibrato increases gradually to its full depth from the beginning of the note to the selected attack time.



vibrato mod depth, attack decay panel 5



vibrato invert, bias panel 5

Biasing the vibrato

Normally, when vibrato is added to a partial timbre, the pitch of each note fluctuates an equal amount above and below the pitch of the key pressed. The total range in semitones is determined by the **depth setting.**

When bias is turned on, the pitch fluctuation can be entirely above the pitch of the key pressed or entirely below it.

- To create a vibrato in which the pitch fluctuation is entirely above the key pressed, use the following instructions.

  1. Press **vibrato bias.**

     The button lights.

  2. Play a note.

     The lowest point of pitch fluctuation is the pitch of the note played; the highest point is twice the number of semitones set by the vibrato depth setting higher.

- To create a vibrato in which the pitch fluctuation is entirely below the key pressed:

  1. Press **vibrato bias.**

     The button lights.

  2. Press **vibrato invert.**

     The button lights.

  3. Play a note.

     The highest point of pitch fluctuation is the pitch of the note played; the lowest point is twice the number of semitones set by the vibrato depth setting.

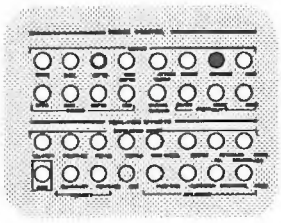
Quantizing the vibrato

Normally, the fluctuations in pitch produced by a vibrato are smooth and gradual. When the quantize function is turned on, however, the fluctuations in pitch are quantized, or stepped, in semitone intervals.

To set up a quantized vibrato, use the following instructions:

1. Set the vibrato wave, depth and rate as desired.

2. Press **vibrato quantize.**



quantize
panel 5

You can combine quantized vibrato with either the **repeat** or **arpeggiate** functions or both for special effects.

1. Press **repeat/arpeggiate rate.**

2. Select a rate with the control knob that is integrally related to, but not necessarily identical with, the vibrato rate.

3. Press **repeat.**

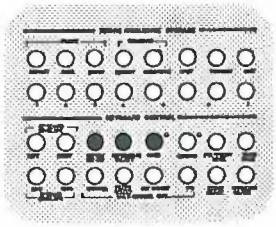
4. Play a note.

   As you hold down the note, it is repeated at the repeat rate. Each repeat sounds on different quantized pitches according to where in the vibrato cycle each repeated note occurs.

5. Press **arpeggiate.**

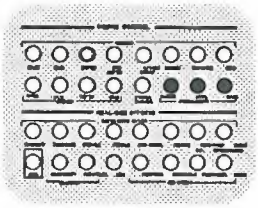
6. Play a chord.

   As you hold down the keys, notes are repeatedly arpeggiated. The notes occur at varying pitches according to where they occur in the vibrato cycle .



repeat, arpeggiate ,
rate
panel 4

Portamento and amplitude modulation



portamento on/off, mode, rate
panel 5

Portamento

When portamento is added to a partial timbre, each note glides to the next. You can program the pitch curve of the glide to be either linear or logarithmic.

1. Select the partial timbre(s) to contain the portamento function.

2. Press the **portamento on/off** button to turn on the portamento function.

3. Press **portamento mode** to select the logarithmic mode, if desired.

   When the **portamento mode** button is lit, the pitch curve of the portamento is logarithmic. When the **portamento mode** button is not lit, the pitch curve of the portamento is linear.

4. Press the **portamento rate** button.

   The button lights, and the display window shows

   [number] GLIDE

5. Use the control knob to select a portamento rate between 0.000 and 1.000.

At a rate of 0.000, it takes almost a minute for a pitch to travel from one pitch to another. At a rate of 1.000, the change between one pitch and the next is instantaneous.

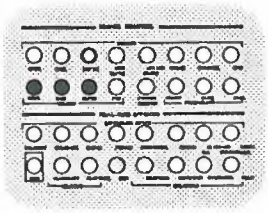
Amplitude modulation or tremolo

Amplitude modulation, or **tremolo,** can be thought of as a periodic variation in volume.

There are four tremolo modes: two attack modes and two decay modes. The attack modes cause a note to begin at a low volume point and rise to full volume. The note then continues to fluctuate at a specified rate. The decay modes cause a note to begin at full volume and decrease to a specified low point.

Both attack and decay modes can be either synchronous or independent. In the synchronous mode, all notes are loud and soft at the same moment. In the independent mode, each note begins its cycle independently.

Amplitude modulation (con't)



stereo wave, rate, depth panel 5

Adding amplitude modulation

1. Use the **partial timbre** buttons to select the partial timbre(s) to contain the modulation.

2. Press the **stereo wave** button.

   The button lights, and the display window shows

   0–STATIONARY

3. Use the control knob or press the **stereo wave** button repeatedly to select one of the four amplitude modulation modes (see table opposite).

4. Press the **stereo rate** button.

   The button lights, and the display window shows

   [number] HERTZ

5. Use the control knob to select a rate between 0.0 and 6.0 hertz.

6. Press the **stereo depth** button.

   The button lights, and the display window shows

   [number] ST DEPTH

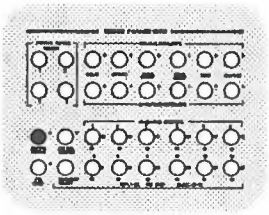
7. Use the control knob to select a tremolo depth between 0 and 50.

Notice that with a depth setting of 0, the amplitude does not fluctuate, but remains at the specified ve sustain level. With a depth setting of 50, the amplitude fluctuates between the full programmed volume level and zero.

Note: When using amplitude modulation settings, the other functions of the **stereo wave** button are not available to the selected partial timbre.

figure 5.2
Amplitude modulation modes

mode displayed	mode definition
21–SYNC AM ATTACK	Synchronous attack mode. Tremolo begins at lowest volume point and rises to full volume. Modulation is synchronized for all notes.
22–IND AM ATTACK	Independent attack mode. Tremolo begins at lowest volume point and rises to full volume. Modulation is independent for each note.
23–SYNC AM DECAY	Synchronous decay mode. Tremolo begins at full volume and falls to lowest point. Modulation is synchronized for all notes.
24–IND AM DECAY	Independent decay mode. Tremolo begins at full volume and falls to lowest point. Modulation is independent for all notes.



partial tuning panel 1

Partial timbre tuning

Each partial timbre can be individually tuned. You can use this feature to create harmonic relationships, phase shifts or complex modulations between individually tuned partial timbres.

1. Press the **partial tuning** button.

   The button lights, and the display window shows

   [number] HERTZ

2. Use the control knob to select a new pitch from 0.0 to 1760.0 in 0.1 hertz increments. (A above middle C is 440.0.)

   Or press the **partial tuning** button repeatedly to increment the partial tuning in octaves:

   110.0 220.0 440.0 880.0 1760.0

You can establish constant tuning for a partial timbre by dialing in a negative number. In this case, the partial timbre sounds at the pitch specified to the right of the minus sign, regardless of what note is played. This makes it possible to create effects such as a guitar timbre that has the constant sound of the pick on one partial timbre while the remaining partial timbres contain the pitched guitar sound.

Partial timbre volume

The volume of each partial timbre can be individually adjusted.

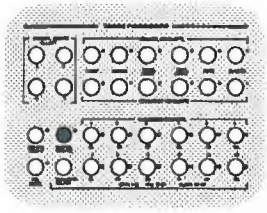
To set the volume of a partial timbre:

1. Press the **partial volume** button.

   The button lights, and the display window shows

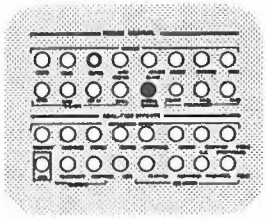
   [number] PARTIAL V

2. Dial a number between 0 for no volume to 100 for full volume.



partial volume panel 1

Chorus



partial chorus
panel 5

Partial chorus

The partial chorus function adds another voice to the selected partial timbre without affecting the other partial timbres in the timbre. The additional voice, which contains an identical set of harmonic coefficients, can then be tuned to any desired relationship with the selected partial timbre.

1. Press the **partial chorus** button.

   The button lights and the display window shows

   [number] PAR CHOR

2. Use the control knob to select a partial chorus setting between 0.000 and 10.000.

The number dialed in establishes the interval above or below the pitch of the selected partial timbre, with 1.000 representing a unison.

You can achieve phase shift effects (flanging) by tuning the added voice to a pitch very near the fundamental or an octave harmonic or subharmonic. A setting of 1.003 or 0.998 results in difference tones which are below the audible range, but are noticeable as phase shift in the upper harmonics of the tone.

You can reinforce the existing harmonics of a tone by dialing in an integer as shown in the table on the opposite page.

Inharmonic frequencies producing harsh effects can be added by selecting certain non-integer values.

figure 5.3
Partial chorus

settings

partial chorus setting	relationship of added voice to fundamental frequency
0.125	three octaves below
0.250	two octaves below
0.500	one octave below
1.000	unison
1.125	major third above
1.500	perfect fifth above
2.000	second harmonic (octave above)
3.000	third harmonic (octave plus a perfect fifth above)
4.000	fourth harmonic (two octaves above)
5.000	fifth harmonic (two octaves plus a major third above)
6.000	sixth harmonic (two octaves plus a perfect fifth above)
7.000	seventh harmonic (two octaves plus a minor seventh above)
8.000	eighth harmonic (three octaves above)
9.000	ninth harmonic (three octaves plus a major second above)
10.000	tenth harmonic (three octaves plus a major third above)

Keyboard envelope

Keyboard envelope

A keyboard envelope places a partial timbre on a particular section of the keyboard. You can place different partial timbres on overlapping or separate sections of the keyboard. For special effects, you can assign completely different sounding partial timbres to different sections of the keyboard. Or you can use this feature to develop whole timbres, such as piano or strings, that may be played up and down the keyboard with authenticity throughout.

The range of the keyboard to which a partial timbre is assigned consists of three parts:

- the full volume area,
- the lower fade area,
- the upper fade area.

The fade areas are defined by upper and lower end points for the full-volume area (key numbers 10-85) and the fade area length (half-steps 0-85).

Setting the upper limit of a keyboard envelope

1. Press and hold the **right keyboard envelope** button.

2. Select an upper end point for the full-volume area by pressing a key.

   The display window shows

   [number] RIGHT KEY

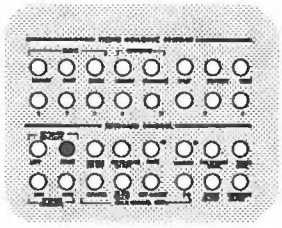
3. Continue to hold the **right keyboard envelope** button and press a key to the right of the previously marked end point.

   Notes within the defined fade area become louder from right to left. Notes to the right of the defined fade area do not sound. The display window shows the length of the fade area computed in half-steps

   [number] RGHT FADE

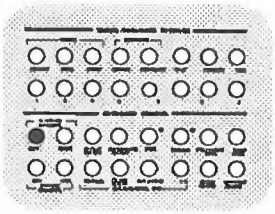
If no fade area is desired, press the same key twice. The fade area length is set to zero.

You can use the control knob to change a number once the keyboard key is pressed. Numbers outside the keyboard range can be selected, allowing keyboard envelopes to be defined for **midi** controllers with larger keyboards.



keyboard envelope right
panel 4

Keyboard envelope (con't)



keyboard envelope left
panel 4

Setting the lower limit of a keyboard envelope

1. Press and hold the **left keyboard envelope** button.

2. Select a lower end point for the full-volume area by pressing a key.

   The display window shows

   [number] LEFT KEY

3. Continue to hold the **left keyboard envelope** button and press a key to the left of the previously marked end point.

   Notes within the defined fade area become louder from left to right. Notes to the left of the defined fade area do not sound. The display window shows the length of the fade area computed in half-steps

   [number] LEFT FADE

If no fade area is desired, press the same key twice. The fade area length is set to zero.

You can use the control knob to change a number once the keyboard key is pressed. Numbers outside the keyboard range can be selected, allowing keyboard envelopes to be defined for **midi** controllers with larger keyboards.

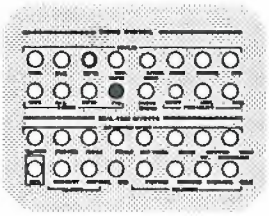
Stereo

With stereo, you can balance the dual outputs of each individual timbre precisely, placing each partial timbre on any of 100 locations between left and right speakers. Thus a timbre with four partial timbres can appear to come from four different locations. When a memory recorder sequence is played, sounds can appear to come from as many locations as you have voices in your Synclavier.

You can also program each partial timbre so that it moves around during live performances or playback of recorded sequences. A partial timbre can move according to key location or it can automatically pan from speaker to speaker during held notes. One partial timbre can move from left to right while others move in reverse direction. Or, by proper positioning of the speakers, some sounds can move toward the listener while others recede.

Stereo settings for each partial timbre are saved when you store a timbre on disk. This information is also recorded when you create a sequence. You can also add stereo to old recorded sequences simply by adding stereo to the timbres in them.

Stereo (con't)



stereo pan panel 5

Static stereo

By default, a static stereo image is present on a partial timbre. Each note played appears to come from the center of the stereo image. To change the stereo position, follow the instructions below.

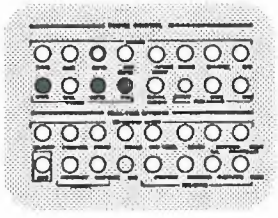
1. Press the **stereo pan** button.

2. Dial the center position setting in the range of -50 (full left) to +50 (full right).

To reset the panning center to zero, press the **pan** button twice.

Moving stereo

The stereo position can also serve as a centerpoint for a moving sound. The pattern, range and centerpoint of the movement are programmed by the buttons **wave, depth** and **pan.** The actual movement is determined by either the specific keys played (modes 3 and 4) or the **rate** button (modes 5 and 6, 9 through 12, and 15 through 18).



stereo wave, depth, pan
panel 5

1. Press **wave.**

2. Dial in a number for a stereo panning mode or waveform selected from the table below; or press the **wave** button repeatedly to step through the mode numbers.

3. Press **stereo depth.**

4. Dial in a stereo panning depth from 0 to 50 panning units.

5. Press **pan.**

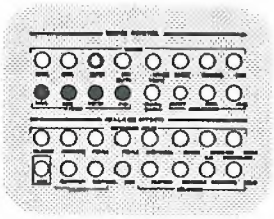
6. Dial in a center position for the moving stereo within the range of -50 (full left) to +50 (full right).

Automatic panning

In the automatic panning modes, the output is moved around in the stereo image at a set rate while you hold down a key.

Modes 9-12 are **synchronous modes.** All notes in a chord are panned together. As you add each new note, the panning picks up at the point in the panning cycle where panning for the previous note left off.

Modes 15-18 are **independent modes.** The panning of each note starts at the beginning of the panning cycle, at the designated centerpoint for the partial timbre.



stereo wave, rate, depth, pan panel 5

1. Press **stereo wave.**
2. Select one of the automatic panning modes by dialing in the appropriate number for the selected mode.
3. Press **stereo rate.**
4. Set the panning rate by dialing in a rate from 0.0 to 6.00 hertz.
5. Press **stereo depth.**
6. Set the panning depth by dialing in a depth from 0 to 50 panning units.
7. Press **stereo pan.**
8. Change the center position, if desired, by dialing in a center position from -50 (full left) to +50 (full right).

Note: With a depth or rate of 0, there is no automatic panning.

figure 5.4
Stereo modes

#	mode definition
0	Output of the partial timbre remains at defined stereo center position. (Default mode)
1,2	Reserved for future use.
3	Stereo positions mapped to keys on the keyboard. With default center position of 0 and depth setting of 50, centerpoint is at F# above middle C, with lower notes to the right and higher ones to the left. Both centerpoint and depth settings can be adjusted.
4	Mirror image of mode 3.
5	Automatic ping-pong panning between right andleft ends of panning range with each new note triggering a move to the opposite end.
6	Mirror image of mode 5.
7,8	Reserved for future development.
9	Synchronous automatic panning using a sine wave. Panning moves from centerpoint to the right and then to the left.
10	Mirror of mode 9.
11	Synchronous automatic panning using a square wave. Panning moves from centerpoint to the right and then to the left.
12	Mirror of mode 11.
13,14	Reserved for future development.
15	Independent automatic panning using a sine wave. Panning moves from centerpoint to the right and then to the left.
16	Mirror of mode 15.
17	Independent automatic panning using a square wave. Panning moves from centerpoint to the right and then to the left.
18	Mirror of mode 17.
19	Random panning with each note placed at a random position within the panning range.
20	Mirror of Mode 19.

Using the timbre displays

Three graphic and two numeric timbre display screens allow you to view and modify the parameters of any synthesized keyboard timbre.

Accessing the timbre displays

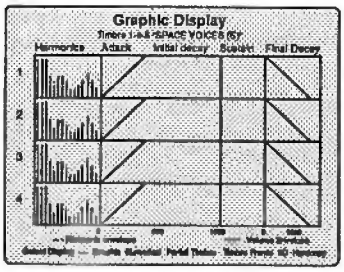
All five timbre displays can be accessed from a graphics terminal; only the numeric timbre display and timbre frame display can be accessed from a non-graphics terminal.

You select the timbre display from the **main menu** by moving the cursor to the item and pressing **<return>** or by typing the letter next to it. You can also use the mouse to select displays. Move the mouse cursor to the selection and click the middle mouse button. If you have a graphics terminal, the graphic timbre display appears on the terminal screen; if you have a non-graphics terminal, the numeric timbre display appears.

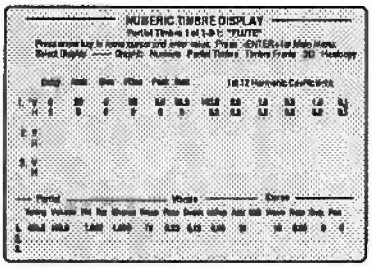
Beneath the title in all five screens are the name and identification numbers (library, bank and entry) of the keyboard timbre. At the bottom of graphic screens and at the top of the numeric screens is a menu which allows you to move to the other timbre display screens or produce hardcopy.

From any screen, you can return to the **main menu** by pressing **<enter>.** You can also return to the **main menu** by moving the mouse cursor to the mouse hole icon at the upper right of the screen and clicking the middle mouse button.

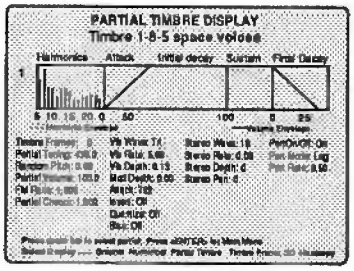
figure 7.1
Timbre display screens



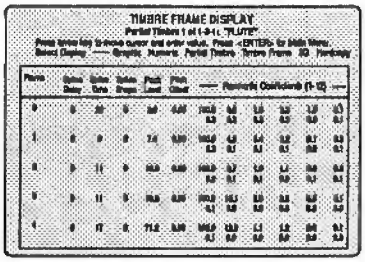
Graphic Display



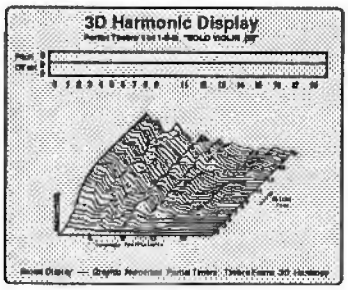
Numeric Timbre Display



Partial Timbre Display



Timbre Frame Display



3D Harmonic Display

Graphic display

The graphic timbre display shows in graphic form the parameters of each partial timbre of the keyboard timbre. You can see the changes when you modify these parameters using the keyboard unit buttons and control knob, and print a hardcopy of the display.

The main part of the screen is divided horizontally into separate graph areas for each partial timbre and vertically into sections for harmonic coefficients, attack and initial decay, sustain, and final decay graphs.

The harmonic coefficients present in each partial timbre are presented at the left on a scale of 0–100% volume.

Volume envelope (solid line) and harmonic envelope or frequency modulation (dotted line) values are shown at the center and right. The vertical scale is 0–100% volume. Changes over time can be observed by reference to the time scale in milliseconds at the bottom. (Since the sustain parameters remain the same no matter how long a note is held, they have no time scale.)

When values are changed, the effect is immediately reflected by changes in the lines on the terminal graphic display, in the values shown in the keyboard display window, and in the sound of the keyboard timbre.

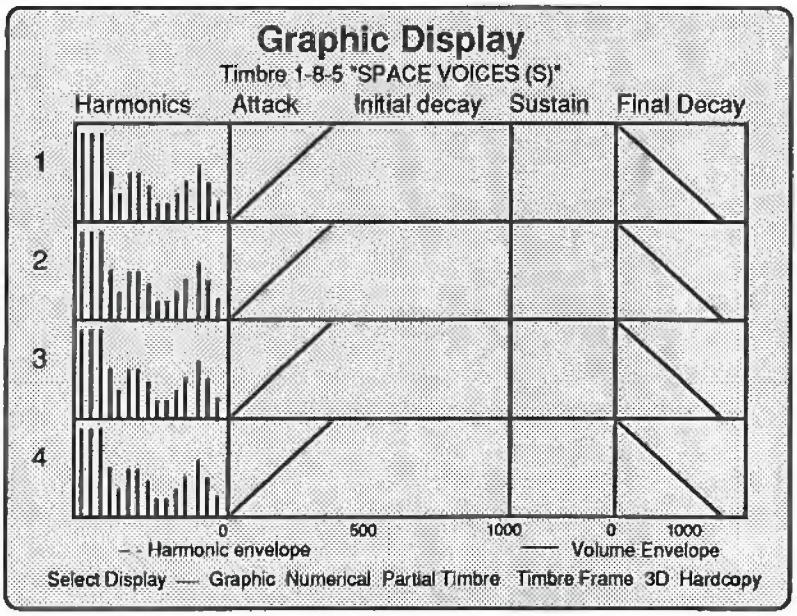


figure 7.2
Graphic timbre display

Numeric timbre display

The numeric timbre display presents the exact numeric values for the timbre parameters of each of the four partial timbres of the keyboard timbre.

Values for time and volume parameters of the **volume envelope (ve)** and **harmonic envelope (he)** for each of the four partial timbres are located in the left half of the middle of the screen. Values for the first twelve harmonic coefficients are on the right half. Across the bottom of the screen are values for other timbre parameters, including partial tuning, partial volume, FM ratio and chorus; vibrato wave, rate, depth, modulation depth, attack and the invert, quantize and bias vibrato functions; and stereo wave, rate, depth and pan.

You can change any parameter from either the keyboard control unit or the terminal itself.

1. Move the cursor to the desired parameter value. Use either the arrow keys on the terminal keyboard, the mouse or the appropriate button on the keyboard control unit.

2. Enter the new value. Type it in on the terminal keyboard or turn the control knob on the keyboard control panel.

   Change in any value is reflected in the terminal display, the display window of the keyboard unit and in the timbre sound.

Note: The vibrato wave form can be changed only by the keyboard controls.

NUMERIC TIMBRE DISPLAY

Partial Timbre 1 of 1-3-1: "FLUTE"

Press arrow key to move cursor and enter value. Press <ENTER> for Main Menu.
Select Display —— Graphic Numeric Partial Timbre Timbre Frame 3D Hardcopy

		Delay	Attck	Dec	FDec	Peak	Sust	1st 12 Harmonic Coefficients					
1.	*V	0	23	0	50	3.5	65.3	100.0	6.5	1.9	3.3	1.0	0.1
	H	0	0	0	0	0	0	0.3	0.3	0.3	0.2	0.0	0.1
2.	V												
	H												
3.	V												
	H												

	Partial				Vibrato						Stereo			
	Tuning	Volume	FM	Rat	Chorus	Wave	Rate	Depth	MDep	Attk	IQB	Wave	Rate	Dep	Pan
1.	400.0	100.0	1.000	1.000		Tri	5.23	0.13	0.00	31		10	0.00	0	0
2.															
3.															

figure 7.3
Numeric timbre display

Partial timbre display

The partial timbre display is a large-scale graphic presentation of the information for any one partial timbre from the graphic display. It also includes alphanumeric values for all of the other settings for that partial timbre. The graphic area may have different time scaling from that shown on the graphic display.

Changes made using the keyboard control unit buttons and control knob are immediately apparent on the terminal screen, in the keyboard display window and in the sound of that partial timbre.

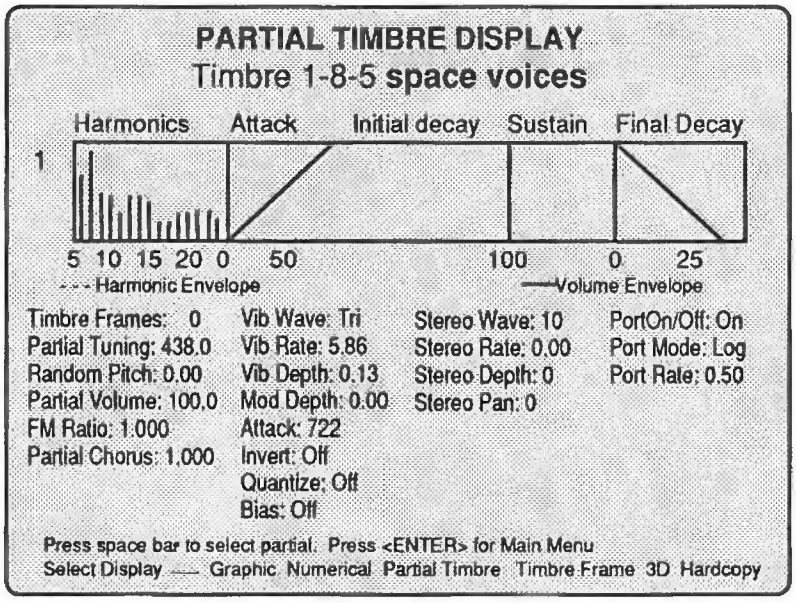


figure 7.4
Partial timbre display

Timbre frame display

The timbre frame display shows the profile of each timbre frame and allows you to make adjustments with either the terminal or keyboard unit.

Numbers on the left identify values across the screen for the first five timbre frames. To bring up additional frames, move the cursor down with the terminal arrow key. Or hold down the appropriate **partial timbre select** button on the keyboard unit and turn the control knob as explained in the section "Resynthesis."

You can change any parameter from either the keyboard control unit or the terminal itself.

1. Move the cursor to the desired parameter value. Use either the arrow keys on the terminal keyboard, the mouse or the appropriate button on the keyboard control unit.

2. Enter the new value. Type it in on the terminal keyboard or turn the control knob on the keyboard control panel.

   Change in any value is reflected in the terminal display, the display window of the keyboard unit and in the timbre sound.

TIMBRE FRAME DISPLAY

Partial Timbre 1 of 1-3-1: "FLUTE"

Press arrow key to move cursor and enter value. Press <ENTER> for Main Menu.

Select Display —— Graphic Numeric Partial Timbre Timbre Frame 3D Hardcopy

Frame	Splice Delay	Splice Time	Splice Shape	Peak Level	Pitch Offset	—— Harmonic Coefficients (1-12) ——					
0	0	23	0	3.5	0.00	100.0	6.5	1.9	3.3	1.0	0.1
						0.3	0.3	0.3	0.3	0.0	0.1
1	0	9	0	7.6	0.00	100.0	4.9	0.4	3.2	0.1	0.2
						0.2	0.1	0.1	0.1	0.0	0.1
2	0	11	0	18.3	0.00	100.0	6.7	1.0	1.1	0.6	0.2
						0.2	0.1	0.1	0.0	0.1	0.1
3	0	11	0	18.3	0.00	100.0	15.1	2.0	2.2	0.5	0.1
						0.1	0.0	0.0	0.0	0.0	0.0
4	0	17	0	71.2	0.00	100.0	12.0	1.1	1.3	0.6	0.1
						0.1	0.0	0.0	0.0	0.0	0.0

figure 7.5
Timbre frame display

3D harmonic display

The 3D harmonic display is a graphic presentation of the development of a changing partial timbre through all of its timbre frames. The main graph plots the relative volume of the 24 harmonic coefficients (numbered at the bottom) on a 0–100% scale. The "third dimensional axis" shows changes from frame to frame over time. That is, each succeedingly plotted line beginning above the bottom scale shows the volume of all 24 harmonics at the next point in time.

Each additional line drawn above and slightly to the right shows similar data a constant amount of time later. Timbre frames, numbered on the right, are shown in proportion to their length; thus, the harmonics of several very short frames may be shown by a single line, while the harmonics of longer frames are represented by several lines. The time span shown, proceeding up and right on the graph, is the total of splice times or lengths of all timbre frames. It may range from milliseconds to minutes.

A smaller graph at the top of the screen plots the pitch offset of each timbre frame using the maximum offset of any frame as the scale maximum.

When new values are entered at the keyboard, the display is automatically redrawn to reflect the *changes*.

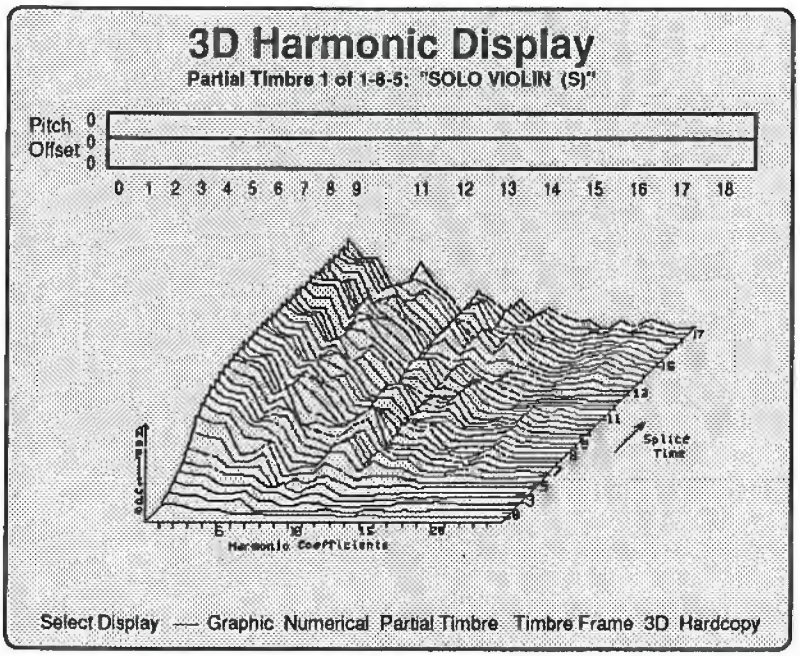


figure 7.6
3D harmonics